J Raptor Res. 29(4):273–275

Age Estimation and Growth Patterns in Nestling Bonelli's Eagles

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Key Words: *Bonelli's eagle*; *growth*; Hieraaetus fasciatus; *Spain*.

Bonelli's eagle (*Hieraaetus fasciatus*) is an endangered European raptor (Rocamora 1994). Although methods for age estimation of the chicks would facilitate research and management, only information based on the general assessment of development is available for this purpose (Blondel et al. 1969, Arroyo et al. 1976, Torres et al. 1981). The only quantitative data available (García 1976, Insausti 1986) are weight and tarsus growth of four and one bird(s), respectively, and do not allow accurate age estimation. The aim of this paper is to provide a quantitative method for ageing Bonelli's eagle chicks, and to present some additional data on Bonelli's eagle nestling growth.

Methods and Study Area

Two nestling Bonelli's eagles were measured in the morning by the same observer every 4 or 5 d at two nests in Penedès County, Catalonia (northeastern Spain) in 1992. Chick A (presumably a male) was measured from age 8–48 d. Chick B (presumably a female) was measured from age 25–51 d. The following measurements were taken: weight, measured with a spring balance to the nearest 50 g; tarsus length from the back of the tarsal joint to the front of the folded central toe; antero-posterior tarsus diameter at the middle point of the leg; culmen length from bill tip to the distal edge of the nostril; claw length and central toe nail length, measured dorsally from the base to the tip of the claw; and foot length, measured ventrally with the foot resting on a flat surface, from the base of the central nail to the base of the claw. All these measurements were taken with a digital calliper to the nearest 0.1 mm. The seventh primary and the central tail feather length were measured with a metal ruler to the nearest 1 mm from the tip of the feather to the skin insertion point. Hatching date was known within 1 d by regular inspections of the nest. For each chick, regression lines were fitted to seventh primary length or tail length in millimeters as the independent variable and age in days as the dependent variable (Sokal and Rohlf 1969, Dapson 1980). The means and standard errors for the slope and the y-intercept of these equations were computed. All statistical analyses were performed with SPSS (SPSS-Inc. 1990). Nest visits were done under permission of the Departament d'Agricultura, Ramaderia i Pesca de la Generalitat de Catalunya.

Results and Discussion

Weight, tarsus length, bill length, nail length, claw length, foot length, and tarsus diameter increased assymptotically, while flight feathers grew linearly (Fig. 1). The chicks gained weight at a rate of 30.4 and 34.6 g/day, slightly below the values derived from previous studies (García 1976, Insausti 1986), which might be caused by sex (Poole 1989) or environmental factors (O'Connor 1984). They reached a maximum weight of 1550 g and 1825 g when 48 d and 51 d, respectively, similar to the values found by García (1976). Chick A reached a maximum rate of weight gain of 81 g/day when 17–22 d old. The average slope of the regression line showing the relationship between age and seventh primary length was 0.16 (SE = 0.007; N = 2) and the average y-intercept was 14.95 (SE = 0.82; N = 2). The equivalent values using tail length were 0.20 (SE = 0.01; N = 2) for the slope and 16.26 (SE = 0.03, N = 2) for the y-intercept. Using these values, the age in days for a chick from 15–51 d of age can be estimated with standard errors ranging from 0.8 d and 2.5 d for the estimates based on primary length and from 0.03 d and 1.1 d for the estimates based on tail length.

Although in nestling raptors feather growth may show sexual variation (Bortolotti 1984, 1989, Mañosa 1994), this tends to be small (Poole 1989, Sodhi 1992), and has little effect on the age estimates (Mañosa 1994). Feather growth may experience variation according to food supply (Moss 1979, Bortolotti 1989), but this is not important unless severe food shortage occurs (Picozzi 1980, Olsen et al. 1982, Donázar and Ceballos 1989, Veiga and Hiraldo 1990). Because feather growth can be measured easily and accurately, it is suitable for age estimation in most situations. In spite of the small sample, which makes interpretation of standard errors misleading, support for the reliability of our equations was obtained by comparing the real age of male and female nestlings which were found shortly after hatching with our age estimates at 39 d old. In both nestlings, the estimated age was 39.7 d using the seventh primary length and 39.1 d and 39.5 d using tail length.

Resumen.—Dos pollos de águila perdicera (*Hieraaetus fasciatus*) fueron medidos en 1992 cada cuatro días durante su período de crecimiento, en dos nidos de Cataluña. Los pollos ganaron peso a razón de 30.4 y 34.6 g/día respectivamente. La edad de los pollos entre 15 y 51 d puede estimarse con una precisión de 2.5 d como edad = 0.159 × longitud primaria + 14.951, o con una precisión de 1.1 d como edad = 0.200 × longitud cola + 16.262.
[Traducción Autores]

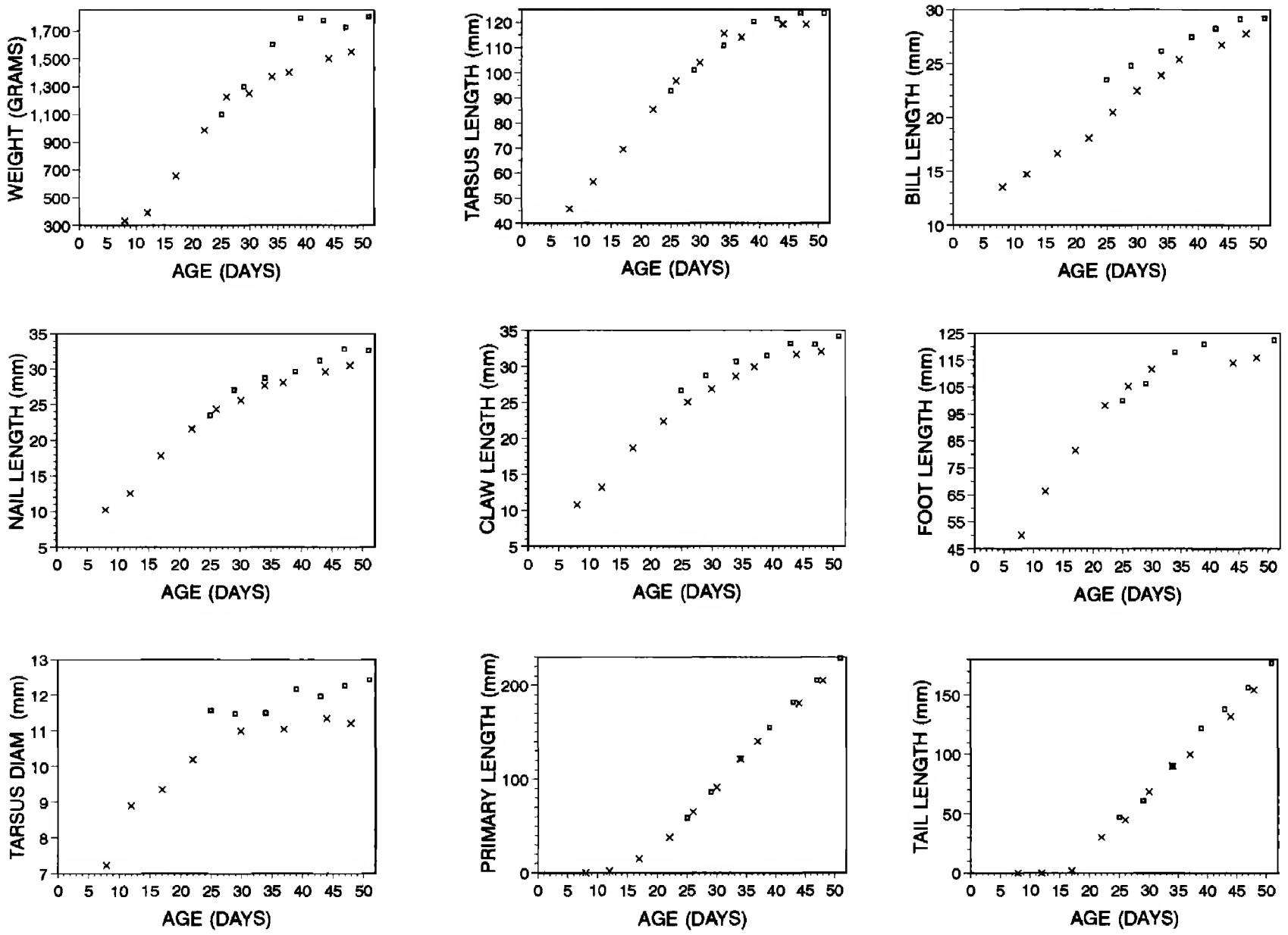

Figure 1. Growth patterns of several body structures for two Bonelli's eagle nestlings.

ACKNOWLEDGMENTS

We are in debt to Miguel Torres S.A. and to the Centre de Recerques Ecològiques i Aplicacions Forestals for financial support. Also to Jaume Terrades, Gérard Rocamora, Fernando Hiraldo, Raimon Mestres and Pedro Milán for their help. Comments from J.A. Donázar and G. Bortolotti substantially improved the original manuscript.

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Received 5 April 1995; accepted 10 July 1995

J. Raptor Res. 29(4):275–277

AUTUMN MIGRATION OF HONEY BUZZARDS IN SOUTHERN ITALY

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KEY WORDS: *honey buzzard*; *migration*; *orientation*; Pernis apivorus.

To date, counts of honey buzzards (*Pernis apivorus*) migrating in autumn over the central Mediterranean have been done only on the island of Malta, where hundreds of individuals have been observed (Beaman and Galea 1974). The peak of autumn migration for this species over the Straits of Gibraltar and the Bosphorus was during the first half of September (Bernis 1973, Cramp and Simmons 1980, Porter and Beaman 1985). Autumn migration over Malta is later, from mid- to the end of September.

The aim of our study was to contribute to the knowledge on the autumn migration of this species in this area of the Mediterranean.

STUDY AREA AND METHODS

Observations were carried out from 24 August to 5 October 1993. Our observation post was on the slopes of Mount Covello at an altitude of approximately 700 m where the distance between the Tyrrhenian and Jonian coasts is narrowest (30 km; Fig. 1). The valley of the River Pesipe separates Mount Covello from Mount Contessa in the west. In this area the Apennines are interrupted by a flat and hilly zone between the two reliefs and the Sila plateau to the north and the Tyrrhenian and the Jonian coasts to the west and the east. Observations were made using 10 × 50 binoculars.

RESULTS AND DISCUSSION

We observed 895 honey buzzards in 326.5 hr of observation. The migration showed two periods of movement, the first containing the major concentrations of individuals, occurred from 31 August to 1 September, and the second occurred from 16–19 September (Fig. 2). Our data contrasted with a previous study in Malta, where the peak of the autumn migration over the central Mediterranean occurred after the first half of September (Beaman and Galea 1974). Our results agree instead with observations made at the Straits of Gibraltar (Bernis 1973) and the Bosphorus (Porter and Beaman 1985).

We found temporal separation between the seasonal passage of adults and juveniles. In 218 cases the honey buzzards were very close (<100 m) overhead and it was possible to observe their plumage; from 24 August to 12 September, 147 (89.6%) were adults and 17 (10.4%) juveniles, while from 13 September to 5 October, 52 (96.3%) were juveniles and only two (3.7%) adults. This means that juvenile honey buzzards migrated later than the adults.